



# Native Node Detection In Wireless Networks With Multipacket Party

P. MANIKYA VEENA

PG Scholar, Department of CSE  
G.K.C.E, Sullurpet, Andhrapradesh, INDIA.

K. SUDHA

Assistant Professor, Department of CSE  
G.K.C.E, Sullurpet, Andhrapradesh, INDIA.

**Abstract:** In wsn Neighbor discovery is one of the first steps in configuring and managing a wireless network. Most existing studies on neighbor discovery assume a single-packet reception model where only a single packet can be received successfully at a receiver. Neighbor discovery in MPR networks is studied that allow packets from multiple simultaneous transmitters to be received successfully at a receiver. Starting with a clique of  $n$  nodes, a simple Aloha-like algorithm is analyzed and show that it takes time to discover all neighbors with high probability when allowing up to  $k$  simultaneous transmissions. Two adaptive neighbor discovery algorithms is designed that dynamically adjust the transmission probability for each node. The adaptive algorithms yield improvement over the Aloha-like scheme for a clique with  $n$  nodes and are thus order-optimal.

## I. INTRODUCTION

Neighbor discovery is one of the first steps in configuring and managing a wireless network. The information obtained from neighbor discovery, viz. the set of nodes that a wireless node can directly communicate with, is needed to support basic functionalities such as medium access and routing. Furthermore, this information is needed by topology control and clustering algorithms to improve network performance.

Due to its critical importance, neighbor discovery has received significant attention, and a number of studies have been devoted to this topic. Most studies, however, assume a single packet reception (SPR) model, i.e., a transmission is successful if and only if there are no other simultaneous transmissions. The proposed neighbor discovery is based on multipacket reception (MPR) networks where packets from multiple simultaneous transmitters can be received successfully at a receiver. This is motivated by the increasing prevalence of MPR technologies in wireless networks. For instance, code division multiple access (CDMA) and multiple-input and multiple-output (MIMO), two widely used technologies, both support multipacket reception.

## II. RELATED PROBLEM

Most studies assume a single packet reception (SPR) model, i.e., a transmission is successful if and only if there are no other simultaneous transmissions. In a SPR network, a node is discovered by each of its neighbors if it is the only node that transmits at a given time instant. Randomized/deterministic neighbor discovery algorithms were proposed in SPR networks.

Tseng et al. propose three power-saving protocols to schedule asynchronous node wake-up times in IEEE 802.11-based multi-hop ad hoc networks, and describe deterministic neighbor discovery schemes

in each of the three protocols. A multiuser-detection based approach is used for neighbor discovery. They require each node to possess a signature as well as know the signatures of all the other nodes in the network. Further, nodes are assumed to operate in a synchronous manner. Although multiuser-detection based approach allow multiple transmitters to transmit simultaneously, their focus is on using coherent/ noncoherent detection or group testing to identify neighbors with a high detection ratio and low false positive ratio, and do not provide analytical insights on the time complexity of their schemes.

## III. PROBLEM ANALYSIS

MPR network, a node can transmit simultaneously with several other neighbors, and each of these nodes may be discovered simultaneously by the receiving nodes. Randomization is used a powerful tool for avoiding centralized control, especially in settings with little a priori knowledge of network structure and Randomization offers extremely simple and efficient algorithms for homogeneous devices to carry out fundamental tasks like symmetry breaking.

two adaptive neighbor discovery algorithms, one being collision-detection based, and the other being ID based. In both algorithms, a node becomes inactive once it is discovered by its neighbors, allowing the remaining active nodes to increase their transmission probability.

When the number of neighbors is not known beforehand or nodes transmit asynchronously, and show that these generalizations result in at most a constant or slowdown in algorithm performance.

Faster neighbor discovery leads to shorter delays

## IV. LITERATURE SUMMARY

Randomized/deterministic neighbor discovery algorithms were proposed in SPR networks.

McGlynn and Borbash propose birthday-like randomized neighbor discovery algorithms that require synchronization among nodes.

Tseng et al. propose three power-saving protocols to schedule asynchronous node wake-up times in IEEE 802.11-based multi-hop ad hoc networks, and describe deterministic neighbor discovery schemes in each of the three protocols. Zheng et al. provide a more systematic treatment of the asynchronous wakeup problem and propose a neighbor discovery protocol on top of the optimal wakeup schedule that they derive.

Borbash et al. propose asynchronous probabilistic neighbor discovery schemes for large-scale networks. Keshavarzian et al. propose a deterministic neighbor discovery algorithm.

Dutta and Culler propose an asynchronous neighbor discovery and rendezvous protocol between a pair of low duty cycling nodes.

Khalili et al. propose feedback based neighbor discovery schemes that operate in fading channels.

A multiuser-detection based approach is used for neighbor discovery. They require each node to possess a signature as well as know the signatures of all the other nodes in the network. Further, nodes are assumed to operate in a synchronous manner. Although these studies allow multiple transmitters to transmit simultaneously, their focus is on using coherent/ noncoherent detection or group testing to identify neighbors with a high detection ratio and low false positive ratio, and do not provide analytical insights on the time complexity of their schemes.

There are numerous studies on neighbor discovery when nodes have directional antennas. The focus in these works is on antenna scanning strategies for efficient neighbor discovery. There have been several recent proposals on neighbor discovery in cognitive radio networks. They determine the set of neighbors for a node as well as the channels that can be used to communicate among neighbors.

## V. IMPLEMENTATION

### Network model

A static network is considered with  $n$  nodes indexed from 1 to  $n$ . Each node has a unique ID (e.g., its MAC address or geographic location). Each node embeds its ID in the messages it transmits to its neighbors. A node,  $x$ , is discovered by another node,  $y$ , if and only if  $y$  successfully receives a message from  $x$ . Each node has an omnidirectional antenna (or an antenna array). The radio at each node is assumed to be half-duplex, i.e., a node can either transmit or receive packets, but not both at the same time. We assume that all nodes have multipacket reception capabilities. That is, a

node can correctly receive packets from multiple transmitters simultaneously.

### RREQ Request

Every node encode RREQ request and send to neighbors. If a nodes send a RREQ request it will be received by all neighbor in the same region. RREQ request contains Sender node ID, request message. This RREQ message is broadcast to all nodes in the network in the same region. RREQ request is encoded and send to all receivers.

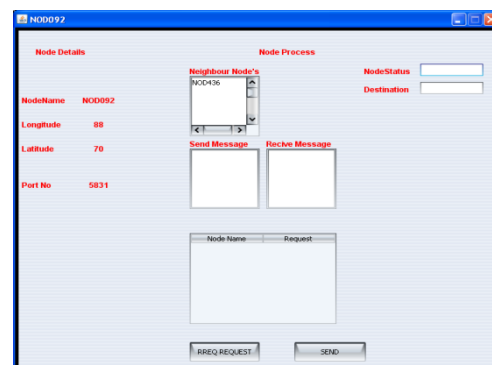
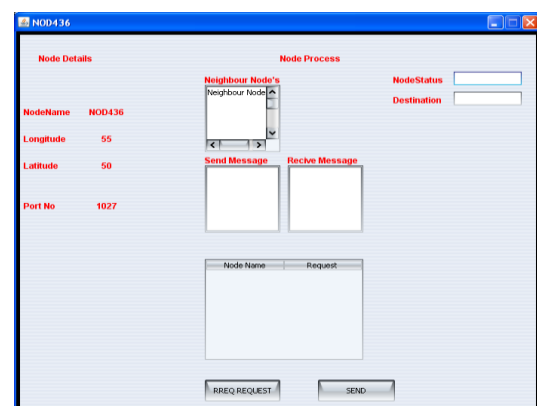
### Multi packer reception (MPR) model

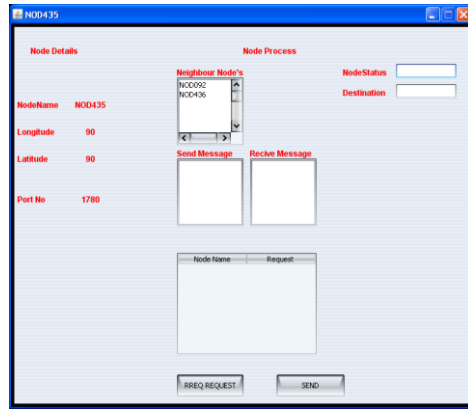
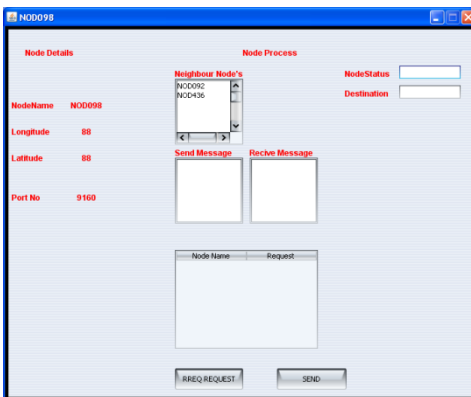
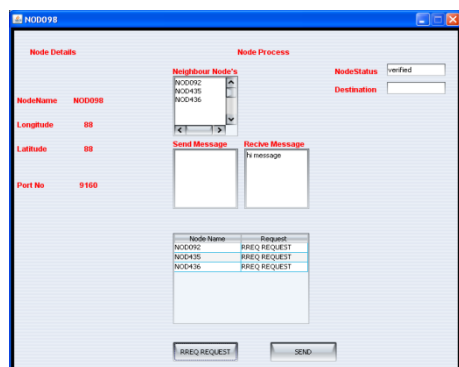
In muti packet reception model, the receiver wait upto receiving  $k$  number of packets from nearby senders, where  $k$  is a constant fixed by network admin. In MRP mode, in which up to  $k$  simultaneous packets can be decoded successfully at a receiver. The value of  $k$  is fixed and is known beforehand.

### Adaptive neighbor discovery

Adaptive neighbor discovery schemes is to provide feedback to the transmitting nodes allowing them to stop transmitting once they have been discovered by their neighbors. This in turn reduces channel contention resulting in faster neighbor discovery. As we will see, the use of feedback results in a  $\ln n$  factor improvement in running time over the Aloha-like algorithm.

## VI. RESULT ANALYSIS



## VII. CONCLUSIONS

Designed and analyzed randomized algorithms for neighbor discovery for both clique and general network topologies under various MPR models. For clique topologies, we started with an Aloha-like algorithm that assumes synchronous node transmissions and a priori knowledge of the number of neighbors  $n$ . It is shown that the total neighbor discovery time for this algorithm is under the idealized MPR model. Designed adaptive neighbor discovery algorithms for the case when a node knows if its transmission is successful or not, and showed that it provides a factor .

## VIII. REFERENCES

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## AUTHOR'S PROFILE



P. Manikya veena has received her B.Tech degree in Computer science Engineering from JNTU Anantapur in 2014 & She is now Pursuing the M.Tech degree at Gokula Krishna College of Engineering (GKCE) at sullurpet, Nellore (D.T), Andhra Pradesh, INDIA. Her areas of research include Wireless sensor network.



K. Sudha has received her B.Tech degree in Information Technology from SASTRA UNIVERSITY Thanjavur in 2007 & M.Tech degree in Computer Science Engineering from PRIST UNIVERSITY Thanjavur in 2010. She is a life member of ISSE, she is dedicate to teaching field from the last six years, her last research areas included Mobile computing and Wireless Sensor Network. At present she is working as assistant professor in Gokula Krishna College of Engineering (GKCE) at sullurpet, Nellore (D.T), Andhra Pradesh, INDIA.